



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 520 902 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
14.09.2005 Bulletin 2005/37

(51) Int Cl.7: **C10L 1/12, C10L 1/30**

(43) Date of publication A2:
06.04.2005 Bulletin 2005/14

(21) Application number: **04023305.8**

(22) Date of filing: **30.09.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL HR LT LV MK

- **Devlin, Mark T.**
Richmond Virginia 23233 (US)
- **Roos, Joseph W**
Mechanicsville Virginia 23116 (US)
- **Human, David M.**
Midlothian Virginia 23113 (US)

(30) Priority: **02.10.2003 US 677787**

(71) Applicant: **Afton Chemical Corporation**
VA 23219 (US)

(74) Representative: **Schwabe - Sandmair - Marx**
Stuntzstrasse 16
81677 München (DE)

(72) Inventors:
• **Guinther, Gregory H.**
Richmond, Virginia 23233 (US)

(54) **Method of Enhancing the Operation of Diesel Fuel Combustion Systems**

(57) A method of enhancing the operation of diesel fuel combustion systems in a combustion system includes supplying a fuel and additive that includes a manganese compound to a diesel fuel combustion system. The fuel is then combusted in the combustion chamber to produce at least one byproduct including the manganese compound. The manganese compound is sup-

plied in an amount effective to complex with the combustion byproduct. The diesel fuel combustion system operation is enhanced by improving the attributes of lubricating oil loaded with the combustion byproduct soot particles.

EP 1 520 902 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 02 3305

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	EP 1 215 272 A (ETHYL CORPORATION) 19 June 2002 (2002-06-19) * paragraphs [0009], [0029], [0030], [0038], [0039], [0041], [0052]; claims 1,2,6-9,20,23-25,58,60; examples 1,2 *	1-3,6,8-17	C10L1/12 C10L1/30 C10L1/30 C10L10/04 C10L1/18 C10L1/24 C10L1/26
D,X	US 5 944 858 A (WALLACE ET AL) 31 August 1999 (1999-08-31) * column 3, line 27 - column 4, line 18; claim 29; example 3 * * column 20, line 48 - column 21, line 44 *	1,2,6,8-18	
D,X	US 4 568 357 A (SIMON ET AL) 4 February 1986 (1986-02-04) * column 4, line 49 - column 5, line 5; claims 1-3 *	1,2,4,5,8,11-17	
X	WO 00/30739 A (CLEAN DIESEL TECHNOLOGIES, INC; VALENTINE, JAMES, M) 2 June 2000 (2000-06-02) * page 5, paragraph 2; claims 1,3,4,9-11 * * page 10, paragraph 3 - page 11, paragraph 1 * * page 13, paragraph 2 *	1,2,6-8,11-17	TECHNICAL FIELDS SEARCHED (Int.Cl.7) C10L
X	WO 87/00193 A (SPAROL INTERNATIONAL APS) 15 January 1987 (1987-01-15) * page 6, line 25 - page 7, line 5; claims 1-3,5,8,9 * * page 12, line 16 - line 23 *	1,2,6-8,11-18	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 July 2005	Examiner de La Morinerie, B
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

4
EPO FORM 1503 03.82 (P04C01)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 02 3305

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	DATABASE WPI Section Ch, Week 198316 Derwent Publications Ltd., London, GB; Class A95, AN 1983-37607K XP002336281 & JP 58 040390 A (CHUHOH KAGAKU KENKY) 9 March 1983 (1983-03-09) * abstract *	1,2,6,9-18	
P,X	----- EP 1 411 108 A (ETHYL CORPORATION) 21 April 2004 (2004-04-21) * paragraph [0024]; claims 1,4-13; examples 1,2,4 *	1-11,13-16	
X	----- WO 95/23836 A (ORR, WILLIAM, C) 8 September 1995 (1995-09-08) * page 127, line 16 - line 27; claims 1,3,5,7,10,11,13; examples 84,87-92 * * page 133 - page 134 * * page 136, line 17 - line 23 * -----	1-3,6,8,10-18	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 July 2005	Examiner de La Morinerie, B
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

4
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 02 3305

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-07-2005

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1215272	A	19-06-2002	US 2002112466 A1	22-08-2002
			BR 0106112 A	06-08-2002
			CN 1381302 A	27-11-2002
			EP 1215272 A1	19-06-2002
			JP 2002221100 A	09-08-2002
			US 2003177758 A1	25-09-2003

US 5944858	A	31-08-1999	EP 0476196 A1	25-03-1992
			AU 635158 B2	11-03-1993
			AU 8465091 A	26-03-1992
			CA 2051452 A1	21-03-1992
			DE 69004692 D1	23-12-1993
			DE 69004692 T2	10-03-1994
			ES 2060058 T3	16-11-1994
			JP 4234489 A	24-08-1992

US 4568357	A	04-02-1986	NONE	

WO 0030739	A	02-06-2000	AU 1632900 A	13-06-2000
			CA 2349846 A1	02-06-2000
			CN 1328481 A	26-12-2001
			EP 1163043 A1	19-12-2001
			JP 2002530578 T	17-09-2002
			WO 0030739 A1	02-06-2000

WO 8700193	A	15-01-1987	DK 294485 A	29-12-1986
			AU 5963286 A	30-01-1987
			WO 8700193 A1	15-01-1987
			EP 0229089 A1	22-07-1987
			FI 870874 A ,B,	27-02-1987
			JP 62503173 T	17-12-1987
			NO 870833 A	27-04-1987

JP 58040390	A	09-03-1983	NONE	

EP 1411108	A	21-04-2004	US 2004074140 A1	22-04-2004
			AU 2003241736 A1	06-05-2004
			CA 2438159 A1	16-04-2004
			EP 1411108 A1	21-04-2004
			JP 2004138049 A	13-05-2004
			SG 105588 A1	27-08-2004

WO 9523836	A	08-09-1995	AP 790 A	16-12-1999
			AU 2115995 A	18-09-1995
			AU 3511799 A	19-08-1999
			BR 9507429 A	16-09-1997

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 02 3305

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-07-2005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9523836 A		CA 2184490 A1	08-09-1995
		CN 1150447 A	21-05-1997
		EP 0748364 A1	18-12-1996
		JP 3660357 B2	15-06-2005
		JP 10500710 T	20-01-1998
		OA 10373 A	08-11-2001
		RU 2205863 C2	10-06-2003
		WO 9523836 A1	08-09-1995
		US 6652608 B1	25-11-2003
		AU 2692795 A	21-12-1995
		CA 2194572 A1	07-12-1995
		EP 0763079 A1	19-03-1997
		WO 9533022 A1	07-12-1995
